home institutions. As proof, says Dixon, “A lot of people started buying equipment.”

Victor Reijis, Special Project Manager for HEAnet, says the conference helped raise awareness that video conferencing over IP networks is easily done. “Also,” he says, “Winning a prize provides some feedback that we are on the right track.”

Says Eshzari, “It really helped demonstrate both the interoperability of different vendors’ video conferencing systems and the visibility of using IP-based networks to carry high-bandwidth video streams for global conferencing. Suddenly global video conferencing wasn’t scary, or outrageously expensive as in the days when the only choice was an ISDN call.”

Marshall notes that participating in the conference gave CANARIE great exposure, connections to other organizations, and a chance to try out the new equipment they had just purchased. “I was responsible for organizing an optimal topology for the MCU hierarchy,” he says, “and learned a lot about instantaneous bandwidth measurements.”

The Megaconference has been extremely helpful to North Dakota State’s initiative. “We learned a lot through participating,” says Sprafka. “It will help us install our H.323 system in our extension sites.” But she notes that one of the best benefits of the Megaconference is the ongoing listserv. “This has been wonderful for us,” she notes. “People on the listserv share ideas and information that help us all move forward.”

Still, implementing the technology has not been without concerns for these early adopters. Reijis of HEAnet notes that firewalls present a problem to H.323 conferencing, a situation that must be solved soon. Marshall points out that there is also a chicken-and-egg problem inherent in any new technology: “There are very few people to call and not great mechanisms to find them. We need a critical mass of users for casual desktop video conferencing to really take off. Also, simple intuitive sharing of applications and general ease of use are barriers to overcome.”

The big challenge is the multipoint control unit, according to Eshzari, “We want to do high-speed, high-quality video conferencing with lots of endpoints, and at this moment in time there’s no machine that can manage high speeds and lots of parties. Second is a good ‘addressbook’ alias scheme that will allow everyone to see everyone else’s machine at any point in time.”

There are ongoing discussions about Megaconference II, to be held in October 2000 in Atlanta, Georgia. This Megaconference will be very different, the world’s first totally virtual conference track. Speakers and chairs will not be physically present, but instead will be located at their home institutions. Says Dixon, “We intend this to be the model for all other conferences on all subjects. Internet video will increasingly be used at conferences, and this is the full-scale start.”

The entire conference will be totally interactive, so that any audience member anywhere can ask questions of any speaker, and the speakers may have discussions among themselves. During the breaks, the audience members can all talk among themselves or with the speakers as they wish, regardless of where they are, just like an in-person conference. Finally, according to the Megaconference announcement, the speakers will be people who are actually using H.323 video technology today in practical applications in education and research. Live use of the technology in action is strongly encouraged as part of each presentation.

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Noshir Contractor, a professor in the Speech Communications Department at the University of Illinois at Urbana-Champaign says the best thing about using video streaming technology is the way it helped him “rethink the notion of teaching.” The traditional educational model is not particularly collaborative, whether instructor and students are on the same campus or in a distance learning situation. In a typical lecture course, for instance, one (or in the case of team teaching, more than one) instructor distributes information to a group of individual students who then process the information more or less individually. Distance learning courses, in which students view the information via Internet or video connection, are often unable to participate in faceto-face discussion with other students. Though this model of teaching is particularly useful when there is not a quorum of students interested in a specialized topic at any one campus, or when there are insufficient instructional resources at any one institution, students and instructors alike may feel isolated.

For his class on globalization, Contractor used video conferencing as an ideal tool for the collaborative model of distributed cooperative learning and teaching. Developing and delivering a video streamed class across multiple campuses with colleagues Cynthia Stohl of Purdue, Peter Monge and Janet Fulk of USC, and Andrew Flanigan of UC Santa Barbara was for Contractor an experi-
ence that used two usually divergent aspects of the role of college professor. Teaching the video conferenced class would find him in scholarly dialogue with other professors—a practice most often reserved for professional conferences or department meetings—while simultaneously managing discussion among graduate students—a practice most frequently performed in the classroom. For Contractor, this was a rewarding exercise in "collaborative fluency" not found in any other aspect of his profession.

Despite his overall positive experiences with teaching via video conferencing, Contractor warns that it's a lot of work and very time-intensive. Contractor and colleagues on ten different campuses teach as part of an ongoing, multi-university experiment in cooperative learning called Electronic-Quad (E-Quad), initiated by Contractor and Barbara O'Keele at the University of Illinois at Urbana-Champaign. More than a dozen undergraduate and graduate video conferenced courses have been offered through E-Quad, and Contractor can attest to the fact that there are many logistical obstacles to overcome, including the need for a common evaluation scheme and the collaborative task of assembling substantive topics and readings. Each instructor will of course have a set of instructional materials and content preferences from which all of the participating instructors must choose readings and assignments. Contractor and his group report that, "Given the level of distributed expertise among the instructors, the challenge of assembling an interdiscipli
dary focus...required considerable and creative deliberations," facilitated by a "high level of trust and respect." For each course, the group found, collaborating faculty needed to meet via audio conference for several hours prior to the start of the course to identify technologies to be used, formulate course content, select readings, design assignments, and identify guest speakers. Over the course of the semester, faculty members also scheduled planning meetings before each class session to "script" the sequence of discussions, coordinate presentations, and address various other issues, including making adjustments in response to student feedback.

Addressing each of these obstacles requires significant planning among instructors, even something as simple as the coordination of course titles and calendars becomes more complex when multiple campuses are involved. For instance, schools on the semester system generally begin weeks earlier than those on the quarter system, so students on quarter schools need something resembling a course within a course that begins and ends in sync with their own school calendar without separating them too much from their classmates on semester campuses. Also, when multiple states and time zones are involved, even class meeting times can become too much. For instance, because most of the state of Indiana doesn't recognize Daylight Savings Time, for example, the globalization course meeting time on Purdue's campus could not remain the same throughout the semester.

Another consideration of teaching via video stream is the way mundane concerns can become time sinks. Because a video conference class takes place on several campuses, the size of the class itself often becomes a concern—where a traditional graduate class might have 10-15 students enrolled, the collaborative globalization course taught by Contractor, et al. had 45 students, with teacher response time increasing considerably and raising multiple questions. How can instructors give high-quality responses to such a large group of students? How can instructors help ensure that such a large group of students has enough time to share in whole-class discussion?

Such questions and concerns have led instructors to engage in a kind of metadiscourse with students. According to Contractor, it is important to continue to monitor how things are going throughout the course. Thus, when students reported some discomfort with the way multiple guest speakers cut into whole group discussion time, Contractor and his colleagues felt compelled to take the time to try to change the course in order to more closely meet student needs.

Other concerns include how to manage
Distributed teaching is the least collaborative model of teaching. One or more instructors, who may or may not be co-located, distribute information to a group of individual students who are not co-located. Students take in information and must process it individually, as distance precludes group discussion among them. This model is particularly useful in distance education, wherein no quorum of students is interested in a specialized topic at any one geographical location, or no requisite instructional resources are at any one institution.

Cooperative learning allows some collaboration among students, but not among instructors. One or more instructors, who may or may not be co-located, distribute information to individual students, who then cooperate via small group discussion either in person (when they are co-located) or via Internet connection (when they are not co-located).

A conversational turn-taking when most students are not in the room with you, maintain substantive coherence in whole-class discussion, make the best use of guest speakers without eliminating time for small-group discussion, and facilitate group projects among students on different campuses.

The technology often creates the need for on-the-spot adjustment as well, forcing instructors to take on the role of technical conductor, temporarily more concerned with whether or not the mikes are working than with what is actually being said in class. There is also substantial pre-session technological preparation, which can eat into an instructor's time without necessarily addressing the learning process directly.

Perhaps one reason for the high level of cooperation in video conferenced classes is that the technology is so new and there are obstacles still to be overcome. One example of this collaborative endeavor is a class taught in conjunction with the University of St. Louis in a video streamed class. The University of Illinois at Urbana-Champaign had to loan out the requisite video equipment. Without this level of collaboration—not only among faculty, but also among educational institutions—the technology would still be in the hands of the few.

Is teaching via video stream for everyone? Is it destined to surpass the traditional model of instruction? No, and no. According to Contractor, not all teachers have need of this technology. "If you're trying to teach basic statistics," he says, "there's absolutely no reason for what we do." But there is "a certain niche that is well-served" by video conferencing because the technology "transcends geographical boundaries and perspectives."

Interdisciplinary topics such as globalization or other 21st century topics calling for differing perspectives and diverse areas of expertise, for instance, can benefit from the video conferencing format. The globalization course taught by Contractor and colleagues across the country looked at the course content through different lenses. One instructor focused on the technological aspects of globalization, one on the cultural aspects, one on the economic, one on the political, and so forth.

New or limited subject matter where there is not yet a critical mass of expertise can also be enhanced by the collaborative model. Video streaming can create a quorum of students on several campuses to carry a course which might not find sufficient interest on any one campus, thus facilitating the spread of knowledge across the country.

Another great benefit of video conferencing technology says Contractor, is the opportunity for students at various locations to begin forging professional and social relations with fellow students and
Distributed cooperative learning also allows collaboration among students, but not among instructors. One or more instructors, who may or may not be co-located, distribute information to students, who then collaborate one-on-one, in small groups, and also between groups. Again, collaboration may occur face-to-face when students are co-located, or via Internet connections when students are not co-located.

Distributed cooperative learning and teaching is the most collaborative model. Instructors who are not co-located cooperate among themselves while distributing information to groups of students in multiple geographical locations, working in cross-institutional collaboration. The participants may meet through video conferencing technologies and are also connected via Web-based communication. Multiple collaborative instructors may take different roles in the course, serving as lecturers, facilitators, and/or discussants.

faculty at other institutions.” This offers “significant opportunities for social recon-figuration by shaping and cementing at an early stage in their careers notions of their professional identities and personal identifications with their academic disciplines.” According to Contractor, students in these classes experience the interdisciplinary scholarly environment that awaits them in their professional careers.

As video streaming technology becomes more commonplace, the issue of intellectual property will take on more importance. Who owns what happens in class, the video archives on the course Web site, or the materials posted for students to use? What about the question of royalties for professors who produce a class that is used by colleagues on other campuses? In Contractor’s globalization course, everyone who participated in the class had to sign a document agreeing to let others use the materials, relying on the good will of the participants to keep the questions of ownership and lawsuits at bay.

Another concern is grading. Because students work in groups with others on separate campuses, many students may find themselves being graded by professors not bound by the policies of the school in which they are enrolled. This could lead to litigation if a student were to disagree with a grade and protest evaluation by a professor not employed by the school the student actually attends.

Perhaps the biggest problems facing those using this technology will be administrative. There are great differences in the fees structures of private and state schools, and video streaming courses allow students to take advantage of the benefits of several schools without paying tuition. UC Santa Barbara, for instance, does not yet have access to Internet, but participation by those students in the globalization course was made possible by the fee structure and grant monies of Purdue, the University of Illinois at Urbana-Champaign, and others.

But the looming concerns don’t cast too much of a shadow over Contractor’s work. He notes that the most fun he experienced using the video conferencing technology had less to do with 21st century issues and more to do with traditional academic values. Over the years, Contractor had enjoyed the college-town tradition of inviting grad students to hold their final class meeting at the professor’s home over dinner, but this had to be discontinued in the multi-campus course because of the limitations of video streaming technology. With the installation of a cable modem at home, however, he was able to combine the new technology with the traditional practices he had enjoyed, raising a glass to colleagues and students in Santa Barbara, Los Angeles, and Indiana.

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